

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application	)	<u>PATENT APPLICATION</u>
	)	
Inventors: Rashid, et al.	)	
	)	
Application No.: Unknown	)	
	)	
Filed Date: December 21, 2001	)	
	)	Customer No.: 28554
Title: CROSS-BAR SWITCH WITH	)	
EXPLICIT MULTICAST SUPPORT	)	
	)	

PRELIMINARY AMENDMENT

Box Patent Application  
Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

Applicants respectfully request that the Examiner enter the following amendments to the above-identified patent application, which is a continuation of U.S. Patent Application Serial No. 09/900,514, assigned to Group Art Unit 2661.

AMENDMENTS

Please amend the application as follows:

In the Claims:

Please replace claims 1-38 with claims 39-77 as shown below. Applicants add new claims 39-77 and cancel claims 1-38. All pending claims are reproduced below.

39. (new) An apparatus comprising:  
a set of input ports to receive data packets;

a set of sink ports coupled to said set of input ports to receive and forward said data packets;

a set of data rings coupling said set of input ports and said set of sink ports;  
and

a multi-sink port coupled to a data ring in said set of data rings and a sink port in said set of sink ports.

40. (new) The apparatus of claim 39, wherein said multi-sink port is coupled to each data ring in said set of data rings and each sink port in said set of sink ports.

41. (new) The apparatus of claim 39, wherein said multi-sink port snoops data packets on said data ring to determine whether to accept said data packets based on a first set of criteria.

42. (new) The apparatus of claim 41, wherein said first set of criteria includes said data packets containing destination addresses supported by said sink port.

43. (new) The apparatus of claim 42, wherein said first set of criteria further includes:

said multi-sink port being enabled to receive data packets; and

said multi-sink port having sufficient resources to store said data packets.

44. (new) The apparatus of claim 39, wherein said multi-sink port forwards a data packet from said data ring to said sink port.

45. (new) The apparatus of claim 44, wherein said multi-sink port forwards said data packet to said sink port if said data packet has a destination address corresponding to said sink port.

46. (new) The apparatus of claim 45, wherein said multi-sink port includes a table correlating destination addresses to sink ports in said set of sink ports.

47. (new) The apparatus of claim 44, wherein said sink port determines whether to accept said data packet based on a second set of criteria.

48. (new) The apparatus of claim 47, wherein said second set of criteria includes:

said sink port having sufficient storage resources for storing said data packet;  
and

a total number of packets being received by said sink port not exceeding a predetermined number of packets.

49. (new) The apparatus of claim 39, wherein said multi-sink port includes:  
a ring interface coupled to said set of data rings to receive data;  
a storage buffer coupled to said ring interface to receive and store data; and  
a sink request port coupled to said storage buffer to receive data from said storage buffer and transmit said data.

50. (new) The apparatus of claim 49, wherein said multi-sink port further includes a look-up table coupled to said sink request port containing entries that correlate destination addresses to sink ports in said set of sink ports.

51. (new) The apparatus of claim 49, wherein a sink port in said set of sink ports includes:

a sink port ring interface coupled to said set of data rings to receive data;  
a sink port storage buffer coupled to said sink port ring interface and said sink request port to receive and store data; and

an output port coupled to said storage buffer to receive data from said sink port storage buffer and transmit said data on a communications link.

52. (new) The apparatus of claim 51, wherein a first data bus couples said sink request port to said sink port storage buffer and a second data bus couples said sink request port to said sink port storage buffer.

53. (new) The apparatus of claim 39, wherein a sink port in said set of sink ports includes:

a sink port ring interface coupled to said set of data rings to receive data;

a sink port storage buffer coupled to said sink port ring interface and said multi-sink port to receive and store data; and

an output port coupled to said sink port storage buffer to receive data from said sink port storage buffer and transmit said data on a communications link.

54. (new) The apparatus of claim 53, wherein an input port in said set of input ports includes:

a communications interface to receive data packets from a communications link; and

an input port storage buffer coupled to said communications interface to store data from said data packets, said input port storage buffer coupled to at least one data ring in said set of data rings.

55. (new) A cross-bar switch comprising:

a set of input ports to receive data packets from a communications link;

a set of sink ports coupled to said set of input ports to receive said data packets from said set of input ports;

a set of data rings coupling each sink port in said set of sink ports to each input port in said set of input ports; and

a multi-sink port coupled to each data ring in said set of data rings and each sink port in said set of sink ports.

56. (new) The cross-bar switch of claim 55, wherein each sink port in said set of sink ports snoops data packets on each data ring in said set of data rings and said multi-sink port snoops data packets on each data ring in said set of data rings.

57. (new) The cross-bar switch of claim 55, wherein said multi-sink port snoops data packets on each data ring in said set of data rings to determine whether said data packets are destined for at least one sink port in said set of sink ports.

58. (new) The cross-bar switch of claim 57, wherein said multi-sink port snoops each of said data packets to determine whether said each of said data packets contains a destination address supported by at least one sink port in said set of sink ports.

59. (new) The cross-bar switch of claim 58, wherein said multi-sink port includes a table correlating destination addresses to sink ports in said set of sink ports.

60. (new) The cross-bar switch of claim 55, wherein said multi-sink port includes:

a multi-sink port ring interface coupled to said set of data rings to receive data;

a multi-sink port storage buffer coupled to said multi-sink port ring interface to receive and store data;

a sink request port coupled to said multi-sink port storage buffer to receive data from said multi-sink port storage buffer and transmit said data.

61. (new) The cross-bar switch of claim 60, wherein said multi-sink port further includes a look-up table coupled to said sink request port containing entries that correlate destination addresses to sink ports in said set of sink ports.

62. (new) The cross-bar switch of claim 60, wherein a sink port in said set of sink ports includes:

a sink port ring interface coupled to said set of data rings to receive data;

a sink port storage buffer coupled to said sink port ring interface and said sink request port to receive and store data; and

an output port coupled to said sink port storage buffer to receive data from said sink port storage buffer and transmit said data on a communications link.

63. (new) The cross-bar switch of claim 62, wherein a first data bus couples said sink request port to said sink port storage buffer and a second data bus couples said sink request port to said sink port storage buffer.

64. (new) The cross-bar switch of claim 62, wherein an input port in said set of input ports includes:

a communications interface to receive data packets from a communications link; and

an input port storage buffer coupled to said communications interface to store data from said data packets, said input port storage buffer coupled to at least one data ring in said set of data rings.

65. (new) A method for transferring data packets to target destinations, said method comprising the steps of:

(a) receiving a set of data packets;

(b) transferring said set of data packets to a set of data rings, wherein a set of sink ports is coupled to said set of data rings and a multi-sink port is coupled to said set of data rings;

(c) determining whether said multi-sink port is to accept data packets, based on a first set of criteria; and

(d) forwarding a data packet accepted by said multi-sink port to a recipient set of sink ports in said set of sink ports.

66. (new) The method of claim 65, further including the step of:

(e) said sink ports, collecting data from a data ring in said set of data rings, wherein said data from said data ring has not been forwarded to said sink port by said multi-sink port.

67. (new) The method of claim 66, wherein said step (e) includes the step of:

(1) a first sink port in said set of sink ports, determining whether a first data packet includes a destination address in a predetermined set of destination addresses.

68. (new) The method of claim 67, wherein said step (e) includes the step of:

(2) said first sink port, determining whether to accept said first data packet based on a set of criteria.

69. (new) The method of claim 68, wherein said step (e)(2) includes the steps of:

(i) determining whether said first sink port is enabled to receive data packets;

(ii) determining whether said first sink port has sufficient resources to store said first data packet;

(iii) determining whether said first sink port is currently receiving a maximum allowable number of data packets; and

(iv) determining whether said first data packet has a number of bytes within a predetermined range.

70. (new) The method of claim 65, further including the step of:

(f) said sink ports in said recipient set of sink ports transmitting said data packet collected in said step (e).

71. (new) The method of claim 65, wherein said step (c) includes the step of:

(1) determining whether said data packet contains a destination address corresponding to a sink port in said set of sink ports.

72. (new) The method of claim 71, wherein said step (c) further includes the steps of:

(2) determining whether said multi-sink port is enabled to receive data packets; and

(3) determining whether said multi-sink port has sufficient resources to store said data packet.

73. (new) The method of claim 65, wherein said step (d) includes the steps of:

(1) identifying a destination address in said data packet;

(2) identifying said recipient set of sink ports in said set of sink ports; and

(3) issuing a transmission request to said recipient set of sink ports.

74. (new) The method of claim 73, wherein said step (d) further includes the steps of:

(4) receiving an acknowledgement in response to said transmission request from a first sink port in said recipient set of sink ports; and

(5) transmitting said data packet to said first sink port on a first data bus.

75. (new) The method of claim 74, wherein said step (d) further includes the steps of:

(6) receiving an acknowledgement in response to said transmission request from a second sink port in said set recipient set of sink ports; and

(7) transmitting said data packet to said second sink port on a second data bus.

76. (new) A cross-bar switch comprising:  
a set of input ports to receive data packets from a communications link;  
a set of data rings coupled to each input port to receive data;  
a multi-sink port coupled to each data ring in said set of data rings, wherein said multi-sink port includes:



a multi-sink port ring interface coupled to said set of data rings to receive data,

a multi-sink port storage buffer coupled to said multi-sink port ring interface to receive and store data, and

a sink request port coupled to said multi-sink port storage buffer to receive data from said multi-sink port storage buffer and transmit said data; and

a set of sink ports coupled to said data ring and said multi-sink port to receive data packets, wherein each sink port in said set of sink ports includes:

a sink port ring interface coupled to said set of data rings to receive data,

a sink port storage buffer coupled to said sink port ring interface and said sink request port to receive and store said data, and

an output port coupled to said sink port storage buffer to receive said data from said sink port storage buffer and transmit said data.

77. (new) A method for transferring data packets to target destinations, said method comprising the steps of:

(a) receiving a set of data packets;

(b) transferring said set of data packets to a set of data rings, wherein a set of sink ports is coupled to said set of data rings and a multi-sink port is coupled to said set of data rings;

(c) determining whether said multi-sink port is to accept a data packet, based on a first set of criteria, wherein said step (c) includes the steps of:

(1) determining whether said data packet contains a destination address corresponding to a sink port in said set of sink ports,

(2) determining whether said multi-sink port is enabled to receive data packets, and

(3) determining whether said multi-sink port has sufficient resources to store said data packet; and

(d) forwarding said data packet to a recipient set of sink ports in said set of sink ports, wherein said step (d) includes the steps of:

- (1) identifying a destination address in said data packet,
- (2) identifying said recipient set of sink ports, based on said destination address,
- (3) issuing a transmission request to said recipient set of sink ports,
- (4) receiving an acknowledgement in response to said transmission request from a first sink port in said recipient set of sink ports,
- (5) transmitting said data packet to said first sink port on a first data bus,
- (6) receiving an acknowledgement in response to said transmission request from a second sink port in said set recipient set of sink ports, and
- (7) transmitting said data packet to said second sink port on a second data bus.

In the Specification:

Please replace the title of the above-identified patent application appearing at page 1, line 1 of the application with the title appearing below. A marked up copy of the amended title is shown in Appendix A to this Amendment.

CROSS-BAR SWITCH WITH EXPLICIT MULTICAST SUPPORT

In the Abstract:

Please replace the ABSTRACT of the above-identified patent application appearing at page 43 of the application with the ABSTRACT appearing below. A marked up copy of the amended ABSTRACT is shown in Appendix B to this Amendment.

A cross-bar switch includes a set of input ports for receiving data packets and a set of sink ports for transmitting the received packets to identified targets. A set of

data rings couples the input ports to the sink ports. Each sink port utilizes the set of data rings to accept data packets targeted to destinations supported by the sink port. The cross-bar switch includes a multi-sink port for supporting explicit multicast addressing. The multi-sink port is coupled to each data ring and each sink port. The multi-sink port snoops multicast packets on the cross-bar switch's rings and transfers each packet to a set of sink ports that support the packet's targeted destinations.

REMARKS

Applicants respectfully submit that claims 39-77 are in order for allowance and request consideration of these claims.

The Commissioner is authorized to change any underpayment or credit any overpayment to Deposit Account No. 501826 for any matter in connection with this document.

Respectfully submitted,

Date: December 21, 2001

By: William J. Harmon, III  
William J. Harmon, III  
Reg. No. 40,635

VIERRA MAGEN MARCUS HARMON & DENIRO LLP  
685 Market Street, Suite 540  
San Francisco, California 941105  
Telephone: (415) 369-9660  
Facsimile: (415) 369-9665

[illegible]

## CROSS-BAR SWITCH WITH EXPLICIT MULTICAST SUPPORT

## APPENDIX B

The ABSTRACT of the patent application appearing at page 43 of the application has been amended as follows:

[A cross-bar switch includes a set of input ports for receiving data packets and a set of sink ports for transmitting the received packets to identified targets. A set of data rings couples the input ports to the sink ports. Each sink port utilizes the set of data rings to simultaneously accept multiple data packets targeted to the same destination — creating a non-blocking cross-bar switch. Sink ports are also each capable of supporting multiple targets — providing the cross-bar switch with implicit multicast capability.]

A cross-bar switch includes a set of input ports for receiving data packets and a set of sink ports for transmitting the received packets to identified targets. A set of data rings couples the input ports to the sink ports. Each sink port utilizes the set of data rings to accept data packets targeted to destinations supported by the sink port. The cross-bar switch includes a multi-sink port for supporting explicit multicast addressing. The multi-sink port is coupled to each data ring and each sink port. The multi-sink port snoops multicast packets on the cross-bar switch's rings and transfers each packet to a set of sink ports that support the packet's targeted destinations.